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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/982,086	10/19/2001	Jeong-kwan Lee	1293.1270	6758

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EXAMINER

GEBREMARIAM, SAMUEL A

ART UNIT PAPER NUMBER

2811

DATE MAILED: 11/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/982,086

Applicant(s)

LEE ET AL

Examiner

Samuel A. Gebremariam

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 August 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-12,14-17 and 19-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,3-6, 8-17 and 19-22 is/are allowed.
- 6) ☒ Claim(s) 23-38,41-50,52-56,58-60,62 and 64 is/are rejected.
- 7) ☒ Claim(s) 39,40,51,57,61 and 63 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 23-26, 28-37, 41-50, 52-55, 58, 60, 62 and 64 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. EP 1035423.

Regarding claim 23, Lee teaches (fig. 6) a micro-lens built-in vertical cavity surface emitting laser (VCSEL), comprising: a micro-lens (155) integrally formed on a laser beam emitting surface of the VCSEL and comprising a single convex surface disposed in a window region through which a light beam is emitted, wherein the single convex surface comprises an arch extending through the entire window region (refer to fig. 6, also refer to fig. 3); a lens layer (150) comprising the micro-lens (155) and formed on the laser beam emitting surface of the VCSEL; and an upper electrode (160) formed on a portion of the lens layer excluding the window region.

The limitation of "laser beam is emitted to collimate the laser beam across the window to emit a parallel light beam" is not given patentable weight. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Furthermore since Lee teaches a microlens

Art Unit: 2811

structure (155) with a convex surface, Lee's structure is inherently capable of collimating the laser beam across the entire window region.

Regarding claim 24, Lee teaches (figs. 6 and 7) the entire claimed structure of claim 23 above including a substrate (100); a lower electrode (170) formed underneath the substrate (100); a lower reflector (110); an active layer (120) comprising a light generating region; and an upper reflector (140) comprising a relatively lower reflectivity than that of the lower reflector, wherein the window region is defined by the upper electrode (160) and the micro-lens (155).

Regarding claim 25, Lee teaches the entire claimed structure of claim 23 above including the first focal point of the micro-lens is positioned in the light generating region of the active layer, so that the light beam generated in a narrow light generating region is incident on and condensed by the micro-lens, and is emitted as the parallel light beam. Since Lee's micro-lens is positioned in the light generating region of the active layer, therefore the light beam generated in a narrow light generating region is incident on and condensed by the micro-lens, and is emitted as the parallel light beam as claimed.

Regarding 26, Lee teaches the entire claimed structure of claim 23 above including a high-resistance region (130) between the upper (140) and lower (110) reflectors relatively close to the active layer (120), the high-resistance region having an aperture at a center thereof through which a current flows (fig. 6),

Regarding claim 28, Lee teaches the entire claimed structure of claim 23 above including the micro-lens lies along a central optical axis of the light beam emitted from the VCSEL (fig. 6).

Regarding claims 29-32, Lee teaches the entire claimed structure of claim 23 above including the lower reflector (110), the active layer (120), and the upper reflector (140) are sequentially stacked on the substrate (100), the lower reflector and the upper reflector are formed of alternating semiconductor compounds comprising different refractive indexes and the lower reflector is doped with the same n-type impurities and the upper reflector is doped with p-type impurities (fig. 6, paragraph 0052).

Regarding claim 33, Lee teaches the entire claimed structure of claim 23 including the active layer is formed of GaAs according to a wavelength of the light beam (fig. 6, paragraph 0054).

Regarding claims 34 and 36, Lee teaches the entire claimed structure of claim 23 including that the high-resistance region comprising an aperture at a center thereof through which current applied through the upper electrode flows and high-resistance region is formed by implantations of ions or by selective oxidation in a region of the upper reflector and the micro-lens comprises a convex surface formed by diffusion-limited etching (paragraph 0055).

The limitations that the high resistance as claimed is formed by implantation of ions or selective oxidation and the micro-lens is formed by diffusion-limited etching are considered a product-by-process claim. "[E]ven though product-by process claims are limited by and defined by the process, determination of patentability is based on the

Art Unit: 2811

product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 35, Lee teaches the entire claimed structure of claims 24 and 27 above including the lens layer comprises a thickness of several micrometers (paragraph 0056).

Regarding claim 37, Lee teaches the entire claimed structure of claims 1-3, 5, 6-9 and 23 including the upper electrode is formed on top of the lens layer (fig. 6).

Regarding claim 41, Lee teaches the entire claimed structure of claim 23 above including a forward biased current is applied to the micro-lens built-in VCSEL through the upper and lower electrodes, the light beam comprising a particular wavelength through laser oscillation is transmitted through the upper reflector and the lens layer and is condensed by the micro-lens and emitted as the parallel laser beam (paragraph 0063).

Regarding claim 42, Lee teaches the entire claimed structure of claim 23 above including the VCSEL is a top-emitting type VCSEL (fig. 6).

Regarding claims 43-46, Lee teaches the entire claimed structure of claims 23 above including the micro-lens is formed in the window region of the substrate through which the light beam is condensed and emitted (paragraph 0060).

Regarding claims 47-48, APA teaches the entire claimed structure of claim 23 above including that when a number of stacked layers of the lower reflector is smaller than that of the upper reflector, the reflectivity of the lower reflector is lower than that of the upper reflector and most of the laser beam is emitted through the lower reflector (paragraph 0050).

Regarding claims 49-50, Lee teaches substantially the entire claimed structure of claim 23 above including the lower reflector and the upper reflector are formed of alternating semiconductor compounds comprising different refractive indexes (paragraphs 0049 and 0050).

Regarding claims 52 and 53, Lee teaches the entire claimed structure of claim 23 above including a forward biased current is applied to the micro-lens built-in VCSEL through the upper and lower electrodes, a laser beam comprising a particular wavelength through laser oscillation is transmitted through the lower reflector and the substrate and is condensed by the micro-lens and emitted as the parallel laser beam and the VCSEL is a bottom-emitting type VCSEL and the VCEL is a bottom-emitting type VCSEL (paragraph 0063 and fig. 7).

Regarding claims 54 and 55, Lee teaches the entire claimed structure of claims 23 and 24 above including the window region comprises a maximum width smaller than a size of the light beam generated in the active layer emitted towards the window region. Since Lee's structure is identical to the claimed invention the VCSEL structure of Lee teaches the claimed invention.

Art Unit: 2811

Regarding claim 58, Lee teaches the entire claimed structure of claim 23 and 54 above including the high-resistance region between the upper and lower reflectors relatively close to the active layer, the high-resistance region comprises an aperture at the center thereof through which a current flows (fig. 6).

Regarding claims 60 and 62, Lee teaches the entire claimed structure of claim 23 above including the window and the micro-lens are positioned on a same plane (fig. 6).

Regarding claim 64, Lee teaches the entire claimed structure of claims 23 and 54 above including the VCSEL is a top-emitting type VCSEL (fig. 7).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 27, 38 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee.

Regarding claim 27, Lee teaches substantially the entire structure of claims 23 except explicitly stating that the aperture is small where the current applied through the upper electrode passes a region on the active layer and the light beam is generated in a dot-sized region of the active layer.

Parameters such as size of the aperture and the area of the light beam generated on the active layer in the art of semiconductor manufacturing process are



Art Unit: 2811

subject to routine experimentation and optimization to achieve the desired device characteristics.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the size of the aperture and the light beam area on the active layer as claimed in the structure Lee in order to form a VCSEL structure with improved wavelength selection.

Regarding claim 38, Lee teaches substantially the entire structure of claims 23 except explicitly stating that a distance along an optical axis from the light generating region to a vertex of the micro-lens is equal to a focal length of the micro-lens.

Parameters such as focal length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the optical axis from the light generating region to a vertex of the micro-lens to be equal to a focal length of the micro-lens in the structure of Lee in order to form a VCSEL structure with improved wavelength selection.

Regarding claim 59, Lee teaches substantially the entire structure of claim 23 above except explicitly stating that the diameter of the window is smaller than or approximately equal to a diameter of the aperture of the high-resistance region.

Parameters such as diameter the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the diameter of the window to be smaller than or approximately equal to a diameter of the aperture of the high-resistance region as claimed in the structure of Lee in order to form a VCSEL structure with improved wavelength selection.

***Allowable Subject Matter***

5. Claims 1, 3-12, 14-17, 19-22 are allowed.
6. Claims 39-40, 51, 57, 61 and 63 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

7. Applicant's arguments filed 8/16/2006 have been fully considered but they are not persuasive. Applicant argues that the structure of Lee does not emit collimated parallel light as recited in claim 23. However as stated in the rejection above this limitation is not given patentable weight because recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Furthermore since Lee teaches a microlens structure (155) with a convex surface, Lee's structure is inherently capable of collimating the laser beam across the entire window region.

**Conclusion**

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Gebremariam whose telephone number is (571)-272-1653. The examiner can normally be reached on 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAG  
October 30, 2006

*Douglas W. Owens* 10/30/06

DOUGLAS W. OWENS  
PRIMARY EXAMINER